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CLAIMS

[Claim(s)]

[Claim 1]A battery device, wherein a conductor exposing part of a cell, a conductive connection object in a case, and a conductor exposing part of an electronic circuit are covered by nonaqueous electrolyte-proof nature and a waterproof insulating member in a battery device with which a nonaqueous electrolyte battery and an electronic circuit for cell control were stored in the same case.

[Claim 2]An electronic circuit for cell control A charging control circuit, an overcharge prevention circuit, a controlling-the-discharge circuit, The battery device according to claim 1 being at least one of an overdischarge preventing circuit, an external short circuit detector circuit, an internal short circuit detector circuit, a temperature detector, a cell internal pressure detector circuit, and battery container modification detector circuits.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to improvement of the battery device with which the nonaqueous electrolyte battery and the electronic circuit for cell control were stored in the same case.

[0002]

[Description of the Prior Art]Development of the outstanding rechargeable battery which has the feature of high tension, efficient, high power, and high energy density is demanded by the miniaturization of various electronic equipment in recent years, the weight saving, etc. Since the rechargeable battery (the following, a nonaqueous electrolyte battery, and abbreviation) which uses especially nonaqueous electrolyte has a cell several times the energy density of using conventional aqueous electrolysis liquid, it waits for the utilization.

[0003]Various things, such as lithium cobalt multiple oxides including titanium disulfide, lithium nickel complex oxide, a lithium manganic acid ghost, vanadium pentoxide, a molybdenum sulfide, and molybdenum oxide, are examined by the positive active material of the nonaqueous electrolyte battery.

[0004]The thing which nonaqueous electrolyte made dissolve metal salt used as an electrolyte in an aprotic organic solvent is used. About lithium salt, for example, LiClO_4 , LiPF_6 , What dissolved LiBF_4 , LiAsF_6 , LiCF_3SO_3 , etc. in propylene carbonate, ethylene carbonate, 1,2-dimethoxyethane, gamma-butyrolactone, dioxolane, 2-methyltetrahydrofuran, etc. is used. Although these nonaqueous electrolyte is used being poured into a battery container, where the porous separator was impregnated, or added resin of the amount of polymers and it made it high viscosity, or it made it gel and mobility is lost, it may be used.

[0005]Although more various substances than before have been examined as negative electrode active material of a nonaqueous electrolyte battery, as that from which high energy density is expected, the negative electrode of a lithium system captures the spotlight and a lithium metal, a lithium alloy, the carbon that made the lithium ion hold, etc. are examined.

[0006]As the name shows, electrolysis solutions other than solution are used for a nonaqueous electrolyte battery. Many of nonaqueous electrolyte is inflammabilities, and in order to generate a harmful steam or for mixing of moisture to cause degradation of the characteristic, the power generation element is stored by the container of airtight sealing nature.

[0007]However, gas might be emitted inside the cell by the prolonged neglect in an elevated temperature, overcharge, overdischarge, etc., and it has the discharge mechanism of the internal pressure which operates at the time of high voltage. The discharge mechanism of this internal pressure is for preventing a battery container's changing with unusual high voltage, or exploding, is called a safety valve and a burst film and drops inter cell pressure by emitting gas and nonaqueous electrolyte out of a cell.

[0008]Although a nonaqueous electrolyte battery may be used by a piece, plurality is used in many cases, standing in a row or carrying out a series connection. That which in any case it is used combining the various electronic circuits for cell control in order to improve reliability in use more, and a piece, or two or more cell and various electronic circuits store and comprise in the same case (the following, a battery device, and abbreviation) is common.

[0009]In these electronic circuits, a charging control circuit, an overcharge prevention circuit, a controlling-the-discharge circuit, an overdischarge preventing circuit, an external short circuit detector circuit, an internal short circuit detector circuit, a temperature detector, a cell internal pressure detector circuit, a battery container modification detector circuit, etc. are located.

[0010]A charging control circuit controls external current and voltage from a power supply to the optimal charging state at the time of charge, and prevents charge with high tension or excessive current.

[0011]An overcharge prevention circuit controls the optimal charge and prevents quantity of electricity more than the capacity defined beforehand from charging.

[0012]A controlling-the-discharge circuit prevents discharge by excessive current. Since there is a possibility that inter cell pressure may go up by unusual generation of heat when it discharges with the current more than the permissible dose defined beforehand, discharge by excessive current is supervised and the discharge beyond permissible current is prevented.

[0013]An overdischarge preventing circuit prevents the discharge below the voltage defined beforehand. It is because an electrode and an electrolysis solution will deteriorate, and unusual gas will be generated or service capacity and a charge-and-discharge cycle life will become short, if overdischarge is performed.

[0014]An external short circuit detector circuit detects the short circuit in a battery exterior, and disconnects a discharge path.

The easy fuse of composition is used in many cases.

Although it is the same function as a controlling-the-discharge circuit, there is no controllability of current and it is only cutting a circuit. Since a controlling-the-discharge circuit has a possibility of damaging at the time of discharge by excessive current like an external short circuit, an external short circuit detector circuit is used in order to secure the redundancy of reliability.

[0015]An internal short circuit detector circuit prevents charging accidentally the cell which detects the short circuit inside a cell and carried out the internal short circuit. When the cell which carried out the internal short circuit is charged, an abnormal heat generation is carried out, or gas is emitted, and there is a possibility that inter cell pressure may go up.

[0016]A temperature detector is for preventing being charged and discharged by the unusual temperature environment which separated from the normal operating temperature range of a cell. When charge and discharge are carried out by unusual temperature environment, there is a possibility of cell capacity falling or causing an internal short circuit, the generation of gas, an abnormal heat generation, etc.

[0017]A cell internal pressure detector circuit detects the pressure inside the cell by the pressure variation and abnormal gas generating inside the cell accompanying an electrode reaction, and is used for the display of the amount of charges and discharges, or detection of abnormalities.

[0018]A battery container modification detector circuit detects the change inside a cell, and abnormalities according to modification of a container, and is used for control of the amount of charges and discharges, or detection of abnormalities.

[0019]

[Problem(s) to be Solved by the Invention]Each of internal pressure discharge mechanisms used for the nonaqueous electrolyte battery and various electronic circuits is for securing the normal operation of a cell and securing the reliability at the time of abnormalities. However, inter cell pressure goes up by use under the abnormality conditions by the surcharge by failure of various electronic circuits, overdischarge, and misuse, etc., and the internal pressure discharge mechanism

operates, When nonaqueous electrolyte is emitted to a battery exterior in connection with gas or an electrolysis solution leaks out of a cell according to a certain fault by the side of a cell, a possibility that nonaqueous electrolyte may adhere is in the various electronic circuits stored in the same case. If nonaqueous electrolyte adheres to an electronic circuit, it may malfunction or leak current may flow in a conductor portion, or metal may deposit by an electrocrystallization reaction and a short pass may be produced, or it may react to the moisture in the circumference atmosphere, and may generate heat. The electronic circuit where nonaqueous electrolyte adhered not only cannot expect a normal operation, but a conductor may generate heat according to leak current. That is, although it is the various electronic circuits for the improvement in reliability, once nonaqueous electrolyte adheres, reliability may fall rapidly.

[0020] There are some which covered the part on an electronic circuit board with the epoxy resin, polyurethane, a varnish, etc. in the built conventional battery device as the above-mentioned measure. However, since these resin dissolved in nonaqueous electrolyte, or swelled and carried out exfoliation omission easily, even if it used it for the electronic circuit for nonaqueous electrolyte secondary batteries, it was able to prevent neither malfunction nor a short pass.

[0021]

[Means for Solving the Problem] Then, in a battery device with which a nonaqueous electrolyte battery and an electronic circuit for cell control were stored in the same case, An aforementioned problem is solved by considering it as a battery device, wherein a conductor exposing part of a cell, a conductive connection object in a case, and a conductor exposing part of an electronic circuit are covered by nonaqueous electrolyte-proof nature and a waterproof insulating member.

[0022]

[Embodiment of the Invention] By covering the conductor exposing part of a cell, the conductive connection object in a case, and the conductor exposing part of an electronic circuit with nonaqueous electrolyte-proof nature and a waterproof insulating member, even if nonaqueous electrolyte adheres to the conductive part in a case, the short pass by malfunction or leak current is lost. If all the conductive parts in a case are covered thoroughly, it is the best, but even if it is not necessarily thoroughly covered with the reasons of a mass production line, etc., a suitable expectation effect is acquired.

[0023] Drawing 1 is an important section sectional view of the battery device which is one example of this invention. 1 is a box made of a synthetic resin, and has stored the nonaqueous electrolyte battery 2 and the electronic circuit 3. The conductive connection object of the external terminal 4 and the electronic circuit board 3 and 6 are the conductive connection objects of the electronic circuit board 3 and the cell 2 the external terminal in which 4 was provided in the box 1, and 5.

[0024] The electronic circuit 3 is provided with the overcharge prevention circuit, the controlling-the-discharge circuit, the overdischarge preventing circuit, external short circuit detector circuit, and temperature detector which were included in the substrate of polyimide resin in this example. In the outside which has an internal pressure discharge mechanism which operates when the inside of a cell becomes unusual high voltage, since a power generation element, an electrolysis solution, cell shape in particular, etc. are not limited, the cell 2 omits a detailed description.

[0025] The metal case 2a which is an electric conduction exposed part of a cell, the conductive connection objects 5 and 6, and the conductor exposing part (not shown) of an electronic circuit are covered with nonaqueous electrolyte-proof nature and a waterproof insulating film. Although the polyimide resin coat was used in this example, it does not necessarily limit to this, and it is [anything] good if it is a resin paint film of a water resisting property and nonaqueous-proof solution acidity or alkalinity. Instead of a coat, a metal case and a conductive connection object portion may be covered with the laminate film of aluminium foil, and polyethylene and polypropylene.

[0026] in order to see the effect of this invention, in the state where operated the internal pressure discharge mechanism of the nonaqueous electrolyte battery of the above-mentioned example battery device intentionally, and nonaqueous electrolyte was made to leak, it connected with the

battery charger and was neglected for 48 hours. Although the electrolysis solution of the cell evaporated 48 hours afterward and the stall of the cell itself was carried out with the natural thing, the electronic circuit itself is normal and operating normally was checked.

[0027]For comparison, the same examination was done using the battery device of the above-mentioned example and an identical configuration except not covering the conductor exposing part of the metal case which is an electric conduction exposed part of a cell, a conductive connection object, and an electronic circuit. In this case, generating of air bubbles was observed from several places of the conductive part which touched nonaqueous electrolyte immediately after charge starting, and some substrates were fumed and damaged by fire 20 minutes afterward.

[0028]

[Effect of the Invention]In the battery device with which the nonaqueous electrolyte battery and the electronic circuit for cell control were stored in the same case, this invention is characterized by covering the conductor exposing part of a cell, the conductive connection object in a case, and the conductor exposing part of an electronic circuit by nonaqueous electrolyte-proof nature and a waterproof insulating member as above.

[0029]By this, nonaqueous electrolyte adheres to an electronic circuit, and an electronic circuit malfunctions, or, Since it can prevent leak current flowing in a conductor portion, or metal depositing by an electrocrystallization reaction and producing a short pass, or reacting to the moisture in the circumference atmosphere and generating heat, the battery device whose reliability improved greatly can be provided.

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TECHNICAL FIELD

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PRIOR ART

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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MEANS

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[0022]

[Embodiment of the Invention]By covering the conductor exposing part of a cell, the conductive connection object in a case, and the conductor exposing part of an electronic circuit with nonaqueous electrolyte-proof nature and a waterproof insulating member, even if nonaqueous electrolyte adheres to the conductive part in a case, the short pass by malfunction or leak current is lost. If all the conductive parts in a case are covered thoroughly, it is the best, but even if it is not necessarily thoroughly covered with the reasons of a mass production line, etc., a suitable expectation effect is acquired.

[0023]Drawing 1 is an important section sectional view of the battery device which is one example of this invention. 1 is a box made of a synthetic resin, and has stored the nonaqueous electrolyte battery 2 and the electronic circuit 3. The conductive connection object of the external terminal 4 and the electronic circuit board 3 and 6 are the conductive connection objects of the electronic circuit board 3 and the cell 2 the external terminal in which 4 was provided in the box 1, and 5.

[0024]The electronic circuit 3 is provided with the overcharge prevention circuit, the controlling-the-discharge circuit, the overdischarge preventing circuit, external short circuit detector circuit, and temperature detector which were included in the substrate of polyimide resin in this example. In the outside which has an internal pressure discharge mechanism which operates when the inside of a cell becomes unusual high voltage, since a power generation element, an electrolysis solution, cell shape in particular, etc. are not limited, the cell 2 omits a detailed description.

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[0026]in order to see the effect of this invention, in the state where operated the internal pressure discharge mechanism of the nonaqueous electrolyte battery of the above-mentioned example battery device intentionally, and nonaqueous electrolyte was made to leak, it connected with the battery charger and was neglected for 48 hours. Although the electrolysis solution of the cell evaporated 48 hours afterward and the stall of the cell itself was carried out with the natural thing, the electronic circuit itself is normal and operating normally was checked.

[0027] For comparison, the same examination was done using the battery device of the above-mentioned example and an identical configuration except not covering the conductor exposing part of the metal case which is an electric conduction exposed part of a cell, a conductive connection object, and an electronic circuit. In this case, generating of air bubbles was observed from several places of the conductive part which touched nonaqueous electrolyte immediately after charge starting, and some substrates were fumed and damaged by fire 20 minutes afterward.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The figure showing the battery device concerning this invention example.

[Description of Notations]

- 1 Box
 - 2 Nonaqueous electrolyte battery
 - 3 Electronic circuit
 - 4 External terminal
 - 5 and 6 Conductive connection object
-

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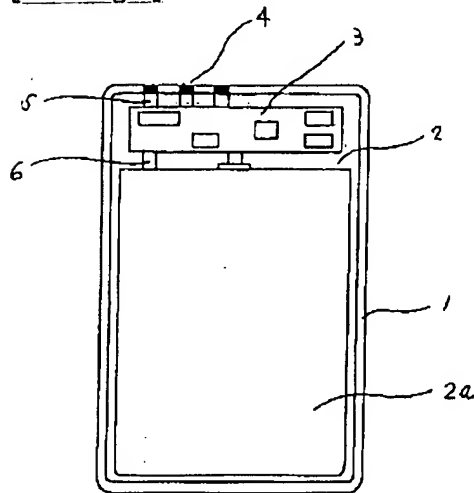
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DRAWINGS

[Drawing 1]



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BATTERY DEVICE

Publication number: JP9139235

Publication date: 1997-05-27

Inventor: TERASAKI MASANAO; MIZUTANI MINORU

Applicant: JAPAN STORAGE BATTERY CO LTD

Classification:

- International: H01M2/08; H01M2/34; H01M10/40; H01M10/46;
H01M2/08; H01M2/20; H01M10/36; H01M10/42; (IPC1-
7): H01M10/46; H01M2/08; H01M2/34; H01M10/40

- European:

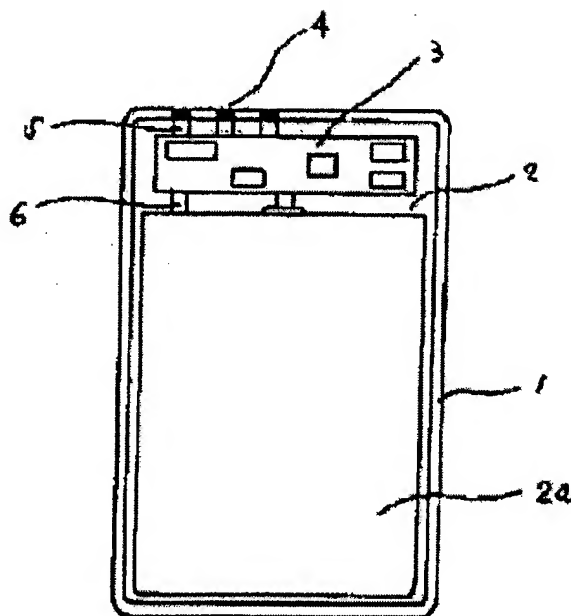
Application number: JP19950323719 19951116

Priority number(s): JP19950323719 19951116

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Abstract of JP9139235

PROBLEM TO BE SOLVED: To prevent the wrong operation by adhesion of nonaqueous electrolyte, leakage current, short circuit and heating and improve the reliability by covering a battery metal case, a conductive connector and the conductor exposed part of an electronic circuit with a nonaqueous electrolyte-resisting and water resisting insulating film. **SOLUTION:** A nonaqueous electrolytic battery 2 and an electronic circuit 3 are housed in a synthetic resin box body 1, and the electronic circuit 3 is connected to an external terminal 4 by a conductive connector 5. The battery 2 is connected to the electronic circuit 3 by a conductive connector 6. The electronic circuit 3 has an overcharge preventing circuit, a discharge control circuit, an over discharge preventing circuit, an external short circuit detecting circuit, and a temperature detecting circuit. The battery 2 has an internal pressure releasing mechanism operated when the battery internal pressure is abnormally high. The metal case 2a for conductive exposed part of the battery 2, the conductive connectors 5, 6 and the conductor exposed part of the electronic circuit are covered with a nonaqueous electrolyte-resisting and water resisting film. The malfunction caused by adhesion of nonaqueous electrolyte, leakage current, short circuit by metal deposition in electrodeposition reaction, or heating of the electronic circuit is prevented to improve reliability.



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(51) Int.Cl. ⁸	識別記号	序内整理番号	F I	技術表示箇所
H 0 1 M	10/46		H 0 1 M	10/46
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	2/34			2/34
	10/40			10/40
				Λ
				Λ
				Z

審査請求 未請求 請求項の数2 F D (全 4 頁)

(21) 出願番号 特願平7-323719

(22) 出願日 平成7年(1995)11月16日

(71) 出願人 000004282

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(72) 発明者 水谷 実

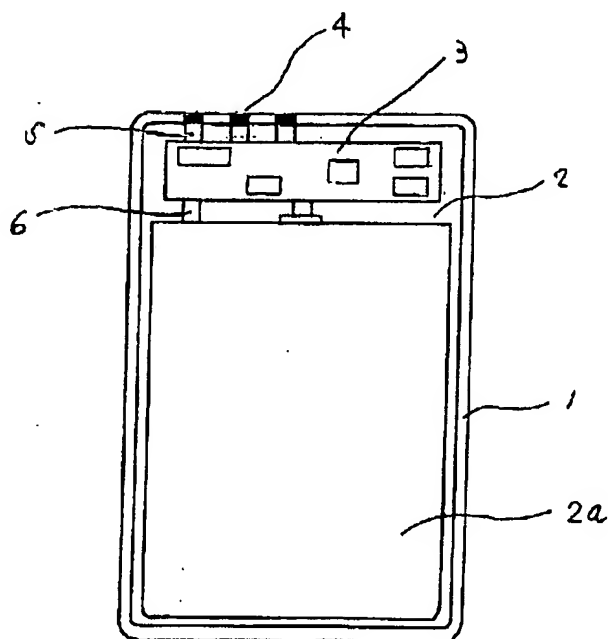
京都市南区吉祥院西ノ庄猪之馬場町1番地
日本電池株式会社内

(54) 【発明の名称】 電池装置

(57) 【要約】

【課題】 電池の内圧放出機構や各種電子回路は、正常な作動を保障し、異常時の信頼性を確保するためのものであるが、非水電解液が電池外部へ放出されると、同一筐体内の電子回路に付着し、電子回路誤動作や短絡、周囲大気中の水分との反応による発熱等の原因になる。このような原因による電池装置の信頼性低下の改善は急務を要する。

【解決手段】 非水電解液電池2と電池制御のための電子回路3とが同一筐体1内に収納された電池装置において、電池の導電体露出部、筐体内の導電接続体および電子回路の導電体露出部を耐非水電解液性かつ耐水性の絶縁部材で被う。



【特許請求の範囲】

【請求項1】 非水電解液電池と電池制御のための電子回路とが同一筐体内に収納された電池装置において、電池の導電体露出部、筐体内の導電接続体および電子回路の導電体露出部が耐非水電解液性かつ耐水性の絶縁部材で被われていることを特徴とする電池装置。

【請求項2】 電池制御のための電子回路が、充電制御回路、過充電防止回路、放電制御回路、過放電防止回路、外部短絡検出回路、内部短絡検出回路、温度検出回路、電池内部圧力検出回路および電池容器変形検出回路のうちの少なくとも1つであることを特徴とする請求項1記載の電池装置。

【発明の詳細な説明】**【0001】**

【発明の属する技術分野】本発明は、非水電解液電池と電池制御のための電子回路とが同一筐体内に収納された電池装置の改良に関する。

【0002】

【従来の技術】近年の各種電子機器の小型化、軽量化等により、高電圧、高効率、高出力、高エネルギー密度の特徴を有する優れた二次電池の開発が要望されている。特に非水電解液を使用した二次電池（以下、非水電解液電池と略）は、従来の水溶液電解液を使用した電池の数倍のエネルギー密度を有することから、その実用化が待たれている。

【0003】非水電解液電池の正極活物質には、二硫化チタンをはじめとして、リチウムコバルト複合酸化物、リチウムニッケル複合酸化物、リチウムマンガン酸化物、五酸化バナジウム、硫化モリブデン、酸化モリブデン等、種々のものが検討されている。

【0004】非水電解液は、非プロトン性の有機溶媒に電解質となる金属塩を溶解させたものが用いられている。例えば、リチウム塩に関しては、 LiClO_4 、 LiPF_6 、 LiBF_4 、 LiAsF_6 、 LiCF_3SO_3 等をプロピレンカーボネート、エチレンカーボネート、1,2-ジメトキシエタン、γ-ブチロラクトン、ジオキソラン、2-メチルテトラヒドロフラン等に溶解させたものが使用されている。これらの非水電解液は、電池容器に注入されて使用されるが、多孔質のセパレータに含浸したり、高分子量の樹脂を添加して高粘性にしたり、ゲル化させて流動性をなくした状態で使用されることもある。

【0005】非水電解液電池の負極活物質としては、従来より様々な物質が検討されてきたが、高エネルギー密度が期待されるものとして、リチウム系の負極が注目を浴び、リチウム金属、リチウム合金、リチウムイオンを保持させた炭素等が検討されている。

【0006】非水電解液電池とは、その名が示すように水溶液以外の電解液を使用するものである。非水電解液の多くは可燃性であり、有害蒸気を発生させたり、水分

の混入によって特性の劣化を引き起こしたりするために、気密な密閉性の容器に発電要素が収納されている。

【0007】しかしながら、高温での長時間放置や過充電、過放電等によって電池内部にガスが発生することがあり、高圧時に作動する内圧の放出機構を備えている。この内圧の放出機構は異常な高圧により電池容器が変形したり破裂するのを防ぐためのもので、安全弁や破裂膜と呼ばれ、ガスや非水電解液を電池外へ放出することにより電池内圧を下げるものである。

【0008】非水電解液電池は一個で使用されることもあるが、複数個が並列もしくは直列接続されて使用されることも多い。いずれの場合にも、使用中の信頼性をより高めるために、電池制御のための各種電子回路と組み合わせ使用され、一個もしくは複数の電池と各種電子回路とが同一筐体内に収納されて構成される（以下、電池装置と略）のが一般的である。

【0009】これらの電子回路には、充電制御回路、過充電防止回路、放電制御回路、過放電防止回路、外部短絡検出回路、内部短絡検出回路、温度検出回路、電池内部圧力検出回路、電池容器変形検出回路などがある。

【0010】充電制御回路は、充電時に外部の電源からの電流や電圧を最適充電状態に制御するもので、高電圧や過大な電流での充電を防止するものである。

【0011】過充電防止回路は、最適充電量を制御するもので、あらかじめ定められた容量以上の電気量が充電されるのを防止するものである。

【0012】放電制御回路は過大電流での放電を防止するものである。あらかじめ定められた許容量以上の電流で放電すると、異常な発熱により電池内圧が上昇する恐れがあるので、過大電流での放電を監視し、許容電流以上の放電を防止するものである。

【0013】過放電防止回路は、あらかじめ定められた電圧以下の放電を防止するものである。過放電を行うと電極や電解液が劣化し、異常なガスを発生したり放電容量や充放電サイクル寿命が短くなったりするからである。

【0014】外部短絡検出回路は、電池外部での短絡を検出し放電経路を切断するものであり、構成の簡単なヒューズが用いられることが多い。放電制御回路と同様な機能であるが、電流の制御能力はなく回路を切断するのみである。放電制御回路は外部短絡のような過大電流での放電時には破損する恐れがあるので、外部短絡検出回路は信頼性の冗長性を確保するために用いられる。

【0015】内部短絡検出回路は、電池内部での短絡を検出するもので、内部短絡した電池が誤って充電されることを防ぐものである。内部短絡した電池を充電すると、異常発熱したりガスが発生して、電池内圧が上昇する恐れがある。

【0016】温度検出回路は、電池の正常な作動温度範囲を外れた異常な温度環境で充電や放電されるのを防止

するためのものである。異常な温度環境で充放電すると、電池容量が低下したり、内部短絡やガス発生、異常発熱等を引き起こす恐れがある。

【0017】電池内部圧力検出回路は、電極反応にともなう電池内部の圧力変化や異常ガス発生による電池内部の圧力を検出するもので、充放電量の表示や異常の検出に用いられる。

【0018】電池容器変形検出回路は、容器の変形により電池内部の変化や異常を検出するもので、充放電量の制御や異常の検出に用いられる。

【0019】

【発明が解決しようとする課題】非水電解液電池に用いられている内圧放出機構や各種電子回路は、何れも電池の正常な作動を保障し、異常時の信頼性を確保するためのものである。しかしながら、各種電子回路の故障による過充電や過放電、誤使用による異常条件下の使用等により電池内圧が上昇して内圧放出機構が作動し、ガスにともなう非水電解液が電池外部へ放出されたり、或は電池側の何らかの不具合により電解液が電池外に漏出したりすると、同一筐体内に収納されている各種電子回路に非水電解液が付着する恐れがある。電子回路に非水電解液が付着すると、誤動作したり、導電体部分で漏洩電流が流れたり、電析反応により金属が析出して短絡現象を生じたり、周囲大気中の水分と反応して発熱したりする可能性がある。非水電解液が付着した電子回路は正常な作動が期待できないだけでなく、漏洩電流により導電体が発熱することがある。すなわち、信頼性向上のための各種電子回路であるが、ひとたび非水電解液が付着すると信頼性は急激に低下しかねない。

【0020】従来のかかる電池装置には、上記対策として、エポキシ樹脂やポリウレタン、ワニス等で電子回路基板上の一部を被覆したものがある。しかしこれらの樹脂は、非水電解液へ溶解したり膨潤したりして、容易に剥離脱落するため、非水電解液二次電池用の電子回路に使用しても誤動作や短絡現象を防ぐことはできなかった。

【0021】

【課題を解決するための手段】そこで、非水電解液電池と電池制御のための電子回路とが同一筐体内に収納された電池装置において、電池の導電体露出部、筐体内の導電接続体および電子回路の導電体露出部が耐非水電解液性かつ耐水性の絶縁部材で被覆されていることを特徴とする電池装置とすることにより、上記課題を解決するものである。

【0022】

【発明の実施の形態】電池の導電体露出部、筐体内の導電接続体および電子回路の導電体露出部が耐非水電解液性かつ耐水性の絶縁部材で被覆されることにより、筐体内の導電性部分に非水電解液が付着しても誤動作や漏洩電流による短絡現象はなくなる。尚、筐体内の全ての導

電性部分が完全に被覆されていればベストであるが、量産工程上の理由等により必ずしも完全に被覆されていなくても、相応の期待効果は得られる。

【0023】図1は、本発明の一実施例である電池装置の要部断面図である。1は合成樹脂製の筐体で、非水電解液電池2と電子回路3とを収納している。4は筐体1に設けられた外部端子、5は外部端子4と電子回路基板3との導電接続体、6は電子回路基板3と電池2との導電接続体である。

【0024】尚、この例では、電子回路3はポリイミド樹脂の基板に組み込まれた過充電防止回路、放電制御回路、過放電防止回路、外部短絡検出回路及び温度検出回路を備えている。また、電池2は、電池内部が異常な高圧になったときに作動する内圧放出機構を有している外は、発電要素、電解液、電池形状等は特に限定されるものではないので、詳述を省略する。

【0025】電池の導電露出部である金属製ケース2a、導電接続体5、6、および電子回路の導電体露出部（図示せず）は耐非水電解液性かつ耐水性の絶縁皮膜で被覆されている。この実施例ではポリイミド樹脂塗膜を用いたが、必ずしもこれに限定するものではなく、耐水性、耐非水電解液性の樹脂塗膜であれば何でもよい。また塗膜の代わりに、金属製ケースや導電接続体部分をアルミニウム箔とポリエチレンやポリプロピレンとのラミネートフィルムで被覆してもよい。

【0026】本発明の効果を見るために、上記実施例電池装置の非水電解液電池の内圧放出機構を故意に作動させ、非水電解液を漏出させた状態で充電器に接続し48時間放置した。48時間後、電池の電解液は蒸発し、電池そのものは当然のことながら機能停止したが、電子回路自体は異常がなく、正常に作動することが確認された。

【0027】比較のために、電池の導電露出部である金属製ケース、導電接続体および電子回路の導電体露出部を被覆しない以外は上記実施例と同一構成の電池装置を用いて同様の試験を行った。この場合、充電開始後すぐに非水電解液と接した導電部分の数カ所から気泡の発生が観察され、20分後に基板の一部が発煙し、焼損した。

【0028】

【発明の効果】以上の通り、本発明は、非水電解液電池と電池制御のための電子回路とが同一筐体内に収納された電池装置において、電池の導電体露出部、筐体内の導電接続体および電子回路の導電体露出部が耐非水電解液性かつ耐水性の絶縁部材で被覆されていることを特徴としている。

【0029】これにより、電子回路に非水電解液が付着して電子回路が誤動作したり、導電体部分で漏洩電流が流れたり、電析反応により金属が析出して短絡現象を生じたり、周囲大気中の水分と反応して発熱したりするこ

とを防止することができるので、信頼性が大きく向上した電池装置を提供することができる。

【図面の簡単な説明】

【図1】本発明実施例に係る電池装置を示した図。

【符号の説明】

- 1 筐体
- 2 非水電解液電池
- 3 電子回路
- 4 外部端子
- 5、6 導電接続体

【図1】

